Space Weather Forecast

Issued on Saturday, 08 October 2022 at 13:14 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of Moderate-class X-ray flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate over the past 24 hours, with a solitary long-period moderate-class X-ray flare seen at 07/1443UTC. This was preceded and followed by a ramping and decline in occasional common-class activity, but this has since fallen into the current UTC day (Saturday 08 October). The sunspot responsible was near the solar meridian and north of the largest on the Sun.

Including the above, there were seven sunspot regions on the current facing side. Perhaps the main change was in the apportionment of the largest and most complex region, which saw its leading sunspots calved off and re-assigned as a new, far smaller magnetically bipolar group. Even after this (semantic) change, this still left a very sizeable parent which remains the most notable region on paper, although flare activity has so far been limited to mid common-class, perhaps because the energy of the spot is well-spread across its span on the solar face. The main development on the current front side was minor growth in the spots of the eastern solar hemisphere, while the western hemisphere groups saw the opposite tendency and faded a little.

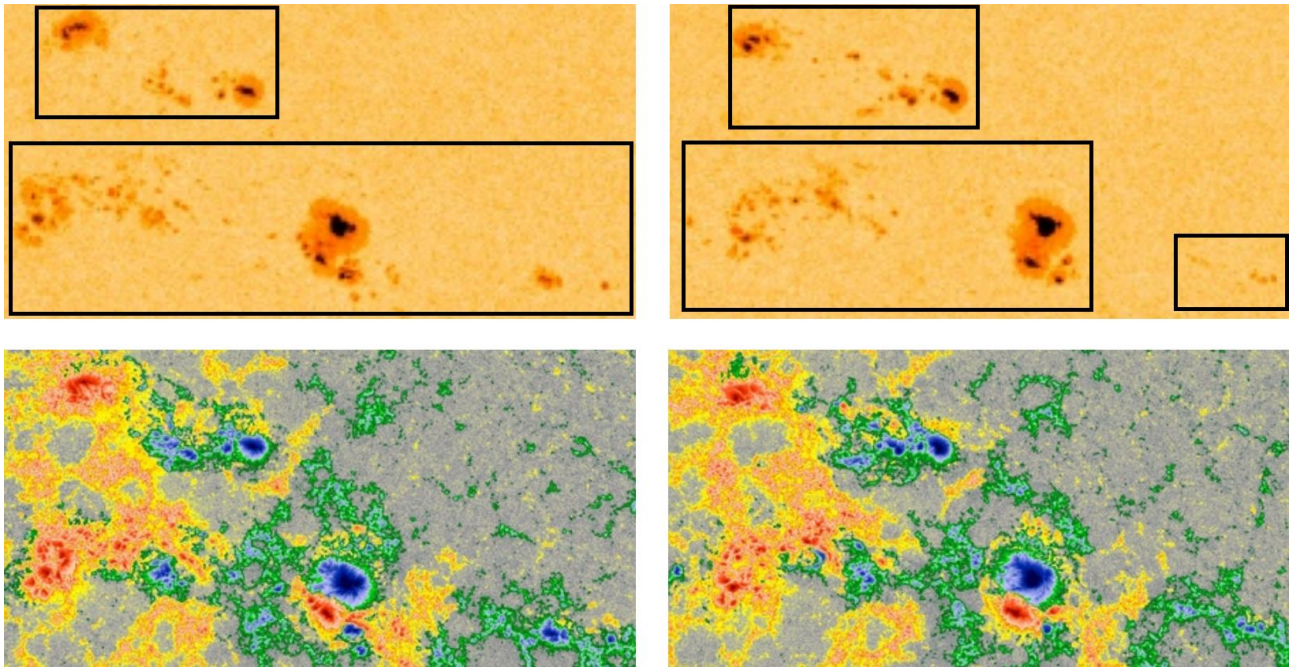

Figure 1: Changes in the main sunspot groups on the Sun in the last 24 hours. Clockwise from top left: visible satellite imagery of the main sunspot groups near the middle of the Sun at 07/1100UTC; 08/1100UTC (showing partition); magnetic polarity imagery from 08/1100UTC; and 07/1100UTC.

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There are currently numerous 'filaments' scattered across the Sun (arcs of plasma that can lift-off to become Coronal Mass Ejections (CMEs). A possible 'prominence eruption' (similar, but on the Sun's edge) narrowly over the northwestern horizon is thought to be the reason for the main CME event on satellite imagery visible in the period - into daylight hours UTC of Saturday - although this will not affect Earth and no solar radiation enhancement appears to have resulted. No CMEs were visible in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind was relatively erratic, rising into Elevated territory for a time before easing to Slightly Elevated. This may be symptomatic of passing between 'coronal hole' fast wind sources on the northwestern solar horizon, but perhaps also a smaller and hitherto forecast feature nearer the middle of the current western solar hemisphere. This final feature is still thought more likely to arrive later in the current UTC weekend, however.

The magnetic field associated with the solar wind was small-scale throughout. It was initially mainly co-aligned with Earth's field, but gradually drifted to more neutral values and then anti-aligned (the latter to greater effect on geomagnetism).

The net result of the above solar wind measures was for mainly quiet activity, peaking early on while the speed was highest and again later as the field became anti-aligned.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Further moderate-class X-ray flares are possible, most likely from either of the pair of sunspot groups near the solar meridian. There is an associated slight chance of strong-class.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs in the forecast, however a CME due to a 'filament eruption' observed 07/0730UTC may conduct a close pass of the Earth on Tuesday 11 October, with peripheral influences possible.

Otherwise, current elevated solar winds are expected to perhaps ease day 1 (8th) for a time, before a further enhancement from any fast wind arrival of a coronal hole either later day 1 or day 2 (8th or 9th). This is low confidence, due to its small size and being new on this 27-day rotation of the Sun. Any enhancement is then likely to ease by day 4 (11th).

Activity for the period should peak with a slight chance of G1/Minor Storms late day 1 and day 2 (8th and 9th) from any fast wind arrival, easing back to become increasingly quiet day 3 and 4, (10th and 11th).

Energetic Particles / Solar Radiation: No solar radiation storms are expected, although there is a daily slight chance of rising to S1 in response to any large flares from the main large sunspot groups.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	20	1	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	40	40	40	40
Very Active	R3 to R5 X	No	10	10	10	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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